Southern Great Plains Newsletter

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Flare Field Campaign Aims to Rid Data of Clutter

A series of aircraft flares were ignited on the ground at the SGP on October 19 and 20, 2004, providing data for development and testing of techniques for suppressing optical clutter that can interfere with observations in the atmosphere.

Representatives of Hanscom Air Force Base (AFB) organized the tests on behalf of the U.S. Missile Defense Agency. The tests were approved by the Oklahoma Department of Environmental Quality and coordinated with the Bureau of Alcohol, Tobacco, and Firearms. SGP personnel provided safety oversight. Before the tests, SGP personnel informed local landowners and fire departments about the nature of the tests, especially the large amount of smoke to be generated by the flares (Figure 1).

While the flares burned on the ground, measurements were collected by infrared sensors onboard the High-Altitude Laser Observatory (HALO) aircraft developed and operated by L3-Aeromet. Personnel from Johns Hopkins University and L3-Aeromet simultaneously operated ground-based instruments from the elevated deck of the Guest Instrument Trailer. This trailer received high marks for its excellent facilities for visiting scientists.

Figure 1. An aircraft flare burns at the test site during the Flare Field Campaign at the SGP central facility (ARM photo).

Hanscom AFB personnel prepared the test site in a pasture just north of the central facility by spreading a layer of sand over an area 10 m by 10 m. SGP personnel secured the area by using cattle guard fencing. The flares were set up and ignited by representatives of Armtec, the flare manufacturer. The prevailing southerly winds carried the smoke away from site personnel and instrumentation.

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After the testing, the manufacturer collected the spent flares (mostly aluminum foil shards) for disposal, and ARM personnel spread the protective sand in a fine layer over the pasture. A post-test inspection at the ignition site ensured that all materials associated with the flares had been collected.

In-House Radar Repairs Save Money and Time

The design of the SGP radar wind profilers (RWPs), which measure vertical profiles of winds and temperature, makes them vulnerable to physical wear and tear. Not only are repairs by the manufacturer extremely costly and time consuming, valuable data are lost in the meantime.

Richard Coulter, RWP mentor for the ARM Climate Research Facility (ACRF), determined that the repairs, needed approximately every two years on ACRF's three RWP units, could be done in-house to save costs and shorten downtime.

The RWP uses an array of mechanical switches, called phase shifters, that change the orientation of the transmission and receiving beams. The beams are moved to sample different volumes of the atmosphere above the radar's location. A beam points directly vertically, then sequentially tilts slightly to the north, east, south, and west. This measurement sequence is repeated several times each hour. Constant RWP operation results in significant wear and tear on the mechanical phase shifters.

Working with John Lucas, an electronics technician for the DOE Atmospheric Boundary Layer Experiments (ABLE) site in Kansas, Coulter perfected repair procedures. The techniques were developed and tested on an RWP in Beaumont, Kansas, that ABLE shares with ACRF. The repair procedure was transferred to ACRF field technician Mike Rainwater, who made the first RWP repair on the radar at Meeker, Oklahoma, site and is now ACRF's RWP repair expert. Mike worked remotely with Coulter and Tim Martin of Argonne National Laboratory, sending digital photographs via the Internet to learn the complicated tasks. As a result, the team reduced costs to repair the RWPs by 86% and cut downtime to only two days (versus two weeks or more formerly).

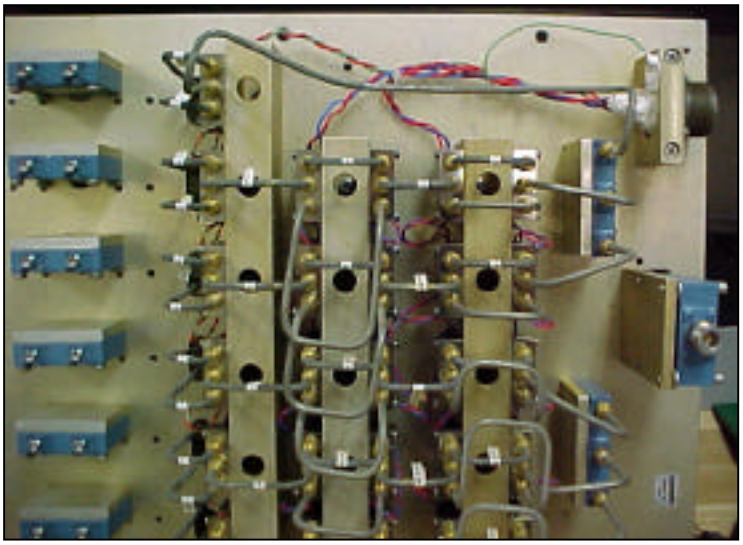

Figure 2. The repaired phase shifter assembly from the Meeker, Oklahoma, radar wind profiler. (ARM photo).